

Remarks/Arguments

Claim Summary

By this Amendment, claim 1 has been revised.

Claims 1-26 remain pending in the application.

Allowable Claims

Applicants acknowledge with thanks the indicated allowability of claims 11 and 12.

35 U.S.C. §103

Claims 1-10 and 13-26 were rejected under 35 U.S.C. §103 as being unpatentable over Laermer et al. (US 5501893) in view of the alleged admitted prior art (APA) for the reasons stated at pages 2-5 of the Office Action. Applicants respectfully traverse this rejection with respect to the now-pending claims.

By this Amendment, independent claim 1 has been revised to clarify that the passivation removal step (c) is separate and distinct from the etching step and the passivation layer deposition step. Amended claim 1 thus clearly defines a three-step process which includes (1) etching, (2) passivation layer deposition, and (3) passivation layer partial removal, where the third step is separate and distinct from the first two steps.

As is apparently acknowledged by the Examiner, Laermer et al. (taken individually or in combination with the APA) does not teach or suggest a three-step process as defined by amended claim 1. In particular, in the Office Action, the Examiner states:

“Laermer describes an etching method for comprising repeatedly performing the steps: etching material using a plasma (col. 3, line 68); depositing a passivation layer on the surface of the etched feature (col. 4, line 26). The etching step includes selectively removing the passivation layer from the base of the etched feature in order that the etching proceeds in a direction perpendicular to the material (col. 4, line 54-56). This

would read on claimed partially removing the passivation from the surface of the etched feature in order the etching of subsequent etching process cycles proceeds in a direction substantially perpendicular to the film surface.” (Emphasis added.)

’ It is apparent that the Examiner has effectively read previous claim 1 to include within its scope a two-step processes, and thus has come to the conclusion that the etching step of Laermer et al., in which the passivation layer is removed from the base of the etched feature during etching, reads on step (c). Present claim 1 defines a three step process and therefore precludes this interpretation. Therefore, as explained in Applicants’ previous responses (incorporated herein), the three step process of the present invention is not obvious in view of the two step process of Laermer et al. This is true whether or not Laermer et al. is combined with the APA.

In the Office Action, the Examiner further states:

“Unlike claimed invention, Laermer doesn’t describe at least one of steps etching and depositing is performed in the absent of a plasma. However, other alternative ways of etching such a wet or vapor etching, using HF and alcohol, and depositing such as a plasma or energetic radiation (absent of plasma) is well known to one skilled in the art as discussed in pages 1, 3, and 4 of the specification. Therefore, at the time of the invention, using other technique for etching including wet, vapor etching or depositing such as energetic radiation (absent of plasma or photo-enhanced polymerization) would have been obvious in order to etch a substrate and deposit a passivation layer with a reasonable expectation of success.”

In response, Applicants respectfully point out that while alternative ways of etching and depositing in the absence of plasma may have been known to one skilled in the art, there were not known in the specific area of alternate (e.g., cyclical) etching/passivation technologies to which the present claims are directed. It was not known prior to the present invention that such plasma-less techniques might be advantageously incorporated in an alternate etching passivation

technique, or that, in order to achieve highly anisotropic etching, a three step process of the type defined by present claim 1 should be employed. Prior to the present invention, the state of the art in the area of alternate etching/passivation technologies was the two-step process exemplified in Laermer et al., in which plasma etching is employed.

For at least the reasons stated above, Applicants respectfully contend that claim 1, and claims 2-26 dependent thereon, define over Laermer et al., taken alone or in combination with the APA.

In the Office Action, the Examiner further states:

“Referring to claim 13, using nitrogen for purging between steps or as a gas carrier is well known to one skill in the art (please see cited arts below).”

While it may be correct that use of nitrogen as a purge gas or a gas carrier is known in other contexts, it is not common practice in connection with the invention of Laermer, and certainly its use in the context of the alternating etch/passivation technique of claim 1 would not have been obvious to one of ordinary skill in the art.

In the Office Action, the Examiner still further states:

“Referring to claim 16, the polymer would be of the formula since the gases used contain C and F such as CHF_3 (claimed precursor). Referring to claim 18-20, page 4 of specification further describes the photo-enhanced polymerization and by means of irradiation which are known and practiced by one skilled in the art. Referring to claims 21, 23, the ion energy such as 10eV would have been obvious to be determined through test runs and the etching gases (col. 6, line 11-20) would be capable of physically removing the passivation layer with chemical enhancement.”

For the record, Applicants respectfully submit that it is by no means clear that the polymer would be pure fluorocarbon $\text{n}(\text{C}_x\text{F}_y)$, with no content of hydrogen or any other constituent of a polymer precursor, especially since the precursors might contain hydrogen.

35 U.S.C. ¶112, first paragraph

Claim 26 was rejected under 35 U.S.C. ¶112, first paragraph, as failing to be adequately described in the specification of the present application. Applicants respectfully traverse this rejection.

The Examiner's attention is directed back to the first full paragraph of page 19 (which, it should be noted, is not contained in the background section of the disclosure). In this paragraph, it is explained that the "choice of chemistry will depend specifically on the materials being etched". After this statement, a number of prior art documents are cited which disclose various etching chemistries. The skilled person would instantaneously and unambiguously understand that the "choice of chemistry" relates to the etching step referred to previously at, e.g., page 8, line 6, of the specification. Furthermore, the skilled person would instantaneously and unambiguously understand that the prior art cited on page 19 is intended to provide examples of suitable choices of chemistry for the present invention.


Applicants thus submit that claim 26 fully complies with the statutory requirements of 35 U.S.C. ¶112, first paragraph.

Conclusion

No other issues remaining, reconsideration and favorable action upon the claims 1-26 now pending in the application are requested.

Respectfully submitted,

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